NCRR FactSheet

NCRR: A Catalyst for Discovery

Biomedical Technology plays a pivotal role in advancing biomedical research. It has the capacity to completely transform research approaches, point to new directions, provide the means of testing and confirming or rejecting new hypotheses, and to uncover new phenomena that demand new theories. The Biomedical Technology (BT) area of the National Center for Research Resources (NCRR) makes the newest and most advanced technologies and techniques accessible to the biomedical research community. The BT area supports research to discover, create, develop, and disseminate innovative technologies for a broad spectrum of research activities. It also provides research institutions opportunities to obtain advanced, high-cost instruments to be shared by groups of researchers supported by the National Institutes of Health (NIH). Research supported by the BT area is multi-disciplinary and transcends the interests of each NIH Institute. The BT area is essential to the mission of NIH to advance research that leads to better health for all humanity.

NCRR is a catalyst for discovery for NIH-supported investigations throughout the nation. It creates, develops, and provides a comprehensive range of human, animal, technological, and other resources to enable biomedical research advances.

The objectives of the BT area are carried out through a variety of grant support mechanisms, including awards for biomedical technology resource centers, investigator-initiated projects, shared instrumentation, and small businesses engaged in research and development and technology transfer.

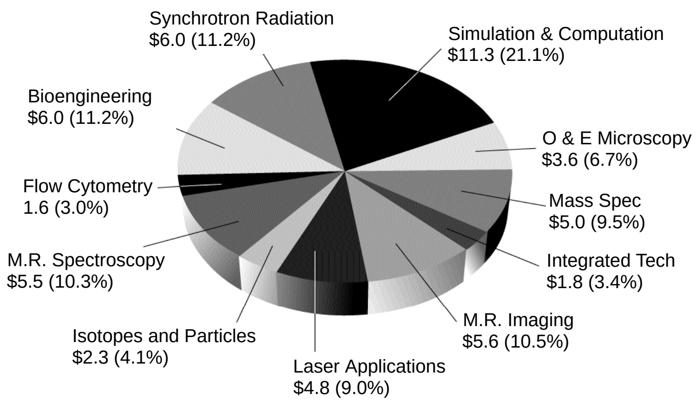
Through research support, new and innovative developments in advanced technologies — high-performance computing, synchrotron radiation, mass spectrometry, and nuclear magnetic resonance imaging and spectroscopy—are rapidly advancing knowledge in many biomedical fields, including structural biology, neuroscience, drug design, and clinical diagnosis. Mass spectrometric analysis of tissue from AIDS patients, for example, has helped scientists pinpoint the onset of the HIV-1 associated dementia with increased expression of the HIV-1 coat proteins. X-ray analysis has elucidated the process by which the immune system evolves or matures the antibodies that specifically recognize foreign molecules produced by bacteria, viruses, and environmental toxins that invade our bodies. The development of hair-thin microprobes that deliver neuroactive drugs to single neurons may help restore nerve connections in spinal cord injury. And, a novel noninvasive method using magnetic resonance imaging to detect the breach of the blood-brain barrier associated with brain disorders may offer new methods of delivery of drugs to the affected areas.

Grant Opportunities

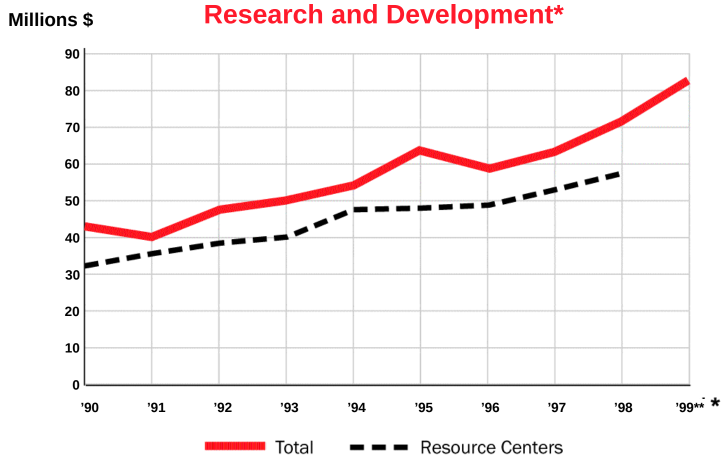
Biomedical Technology Resource Grant— A large portion of the BT budget is directed to the research and development activities at more than 60 Biomedical Technology Resource Centers. These centers are located across the country, primarily at major academic institutions. Principal investigators at the centers lead scientific teams to discover, create, develop, and disseminate technological innovations that have broad applications to studies of biology, medicine, behavior, and health. Each center functions as both a technological and an intellectual resource, with an infrastructure that permits staff scientists to react rapidly and effectively to emerging biomedical research needs. The multidisciplinary environment of each center stimulates innovation

Biomedical Technology Resource Centers

1997 Expenditures
Dollars in Millions



Funding for Biomedical Technology Research and Development*



* Excludes funding for Shared Instrumentation Grants Program (see page 4).
** President's budget request

and collaborations among physical scientists, engineers, and biomedical scientists. These centers, in turn, must make their technologies available to a user community of biomedical researchers. The NCRR *Biomedical Technology Resources* directory describes each center's capabilities.

These NCRR-supported resource centers provide a cost-effective approach for sharing of very complex and costly technological resources as well as an efficient way for leveraging federal funds in an era of constrained research resources. Each year, nearly 6,000 biomedical investigators are either collaborators or users of cutting-edge technologies offered by the centers, and as a result of research conducted there, approximately 3,500 papers are published annually. In addition, many more investigators have benefited from center-sponsored workshops, consultations, and other training activities.

The review criteria by which applicant institutions are evaluated to receive BT-area support include five important functions. The emphasis placed on each function by the applicant institute depends upon the maturity and the developmental goals of the proposed resource.

1) Technological research and development: Proposed technology must be recognized as a creative endeavor and an important, dynamically evolving research and development activity. Areas of opportunity for studying molecular and cellular structure and function include, but are not limited to: Biomedical computing with emphasis on mathematical modeling and simulation; quantitative imaging and visualization; information technology; biomedical engineering; and specialized instrumentation and techniques. An applicant institution must demonstrate that the proposed technology will significantly advance biomedical science and is not broadly available by other means. The proposed research and development could involve development of new instruments and technologies or significant improvements of existing instruments or technologies.

2) Collaborative Research: Discovery of new ways to apply a developing technology to biomedical research is best accomplished through interdisciplinary, collaborative partnerships between resource center staff, who are the experts in the technology, and investigators outside the resource, who have expertise in particular biomedical disciplines. Research often yields unexpected applications beyond the original research goals. In fact, collaborations often drive the research of a new technology and lead to jointly authored publications and eventually to more resource users. Aresource center applying to NCRR for grant support should identify collaborative projects for which a majority must have grant support from NIH.

3) Service: Aresource center must provide investigators from the biomedical research community access to its resources. This includes making available specializedinstrumentation, equipment, software, and techniques, and also offering consultation and technical assistance in their use.

4) Training: Resource centers must provide educational programs that explain the use of their technologies to outside biomedical investigators. Appropriate center activities include short courses, workshops, and individual training of students and visiting scientists.

5) Dissemination: Publicizing available technologies and scientific accomplishments of a center to the biomedical research community will enhance the overall effectiveness of a grant. Aresource center may accomplish this through publication, technology transfer, conferences, workshops, and distribution of products, such as computer software. Each NCRR-supported biomedical technology resource center is expected to have a home page on the World Wide Web to provide information about its research activities and technology.

Researchers interested in submitting grant applications are strongly encouraged to contact a health scientist administrator in the NCRR Biomedical Technology area. Contact information is provided on page 4.

Note: Proposals to develop instruments or technologies related to a specific disease or category of research should be addressed to the appropriate categorical institute of NIH rather than to NCRR.

Investigator-Initiated Biomedical Technology Research Project Grant — This grant mechanism supports research and development of new instruments or technologies, or significant improvements to existing instruments that have broad application to biomedical research. Agrant application should include a well-defined research agenda that addresses a specific instrument or technology. The proposed research may involve conceptualization, design, fabrication, and/or testing of a technology that would lead to a more powerful and precise biomedical research technology. Applications for support under this mechanism should address the following criteria: (a) Scientific, technical, or biomedical significance; (b) originality of the proposed research; (c) adequacy of the proposed engineering approaches and methods; (d) qualifications of the principal investigator and staff who will perform the work; (e) availability of resources necessary for the work; and (f) protective measures against adverse effects upon humans, animals, and the environment.

Note: This mechanism also provides initial research support to newly independent biomedical investigators to develop their research capabilities in the area of technological research and development and to demonstrate the merit of their research ideas.

Exploratory/Development Grant — This funding mechanism was initiated in l997 by the BT area to stimulate exploration of new technologies and new approaches, or to challenge existing paradigms in technologies related to biomedical research. Proposals are expected to encompass work at the edge of new frontiers or the limits of understanding of a biomedical research problem. This grant offers researchers an opportunity to collect preliminary data to support future applications for funding by NCRR or other NIH components.

Evaluations of proposed research will address the degree of innovation, presence of risk, and the potential for impacting biomedical research. Funding is limited to $75,000 in direct costs per year for up to two years. To obtain specific information about the application process, such as current deadlines, see the program announcement posted at the NCRR Web site (see address on page 4).

Other Funding Opportunities — The BT area participates in two federal grant programs that provide support to small businesses.

The Small Business Innovation Research (SBIR) Grant awards $100,000 for a period of up to six months for pilot studies of new biomedical technologies and improvements in existing ones (Phase I). A follow-up grant of $750,000 for a period of up to two years may be awarded after competitive review if the Phase I project meets its goals and is found to have technical and scientific merit as well as commercial potential (Phase II).

The Small Business Technology Transfer (STTR) Grant awards $100,000 for up to one year for Phase I to determine the project's scientific and technical merit and feasibility, and $500,000 for up to two years for Phase II to continue Phase I research.

There is a major difference in the requirements of these SBIR and STTR grants. The SBIR grant does not require outside collaboration, but the primary employment of the principal investigator must be with the small business concern at the time of award and throughout the project period. Investigators or facilities at research institutions may be included under subcontracts or as consultants on SBIRs, but are not required. The SBIR application receipt dates are April 15, August 15, and December 15.

In contrast to the SBIR, the STTR program requires that a small business applicant organization enter into partnership with a research institution in the collaborative conduct of a project that has potential to produce commercial products. The STTR application receipt dates are April 1, August 1, and December 1. Program solicitations and other details are available at the NIH Web site, http://www.nih.gov/grants/funding/sbir.htm.

Shared Instrumentation Grant Program

To stay at the forefront of modern biology and medicine, NIH-supported investigators depend on cutting-edge instruments. These high-sensitivity and high-resolution instruments accelerate the rate at which researchers can acquire, analyze, display, and understand data. At the same time, rapid technological development has quickened the pace at which these new, advanced, state-of-the-art instruments become available and the existing instruments become obsolete. Moreover, these new, sophisticated instruments are often too expensive for investigators to obtain through individual research grants. To help solve this dilemma, the Shared Instrumentation Grant (SIG) Program offers a cost-effective solution by providing a mechanism whereby groups of NIH-supported researchers can apply for commercially available, technologically sophisticated equipment costing more than $100,000.

This grant mechanism optimizes the use of federal funds by allowing expensive instrumentation to be shared among a number of NIH scientists. Asurvey taken in 1993 of the 1,352 SIG instruments awarded between 1982 and 1992 showed that these instruments were being shared by more than 16,000 scientists, with NIH supported researchers accounting for 83 percent of the use time.

Examples of key instruments needed to understand fundamental biological processes include, but are not limited to:

1) High-resolution mass spectrometers and high-throughput protein and nucleic acid sequencers used for the mapping, sequencing, and analysis of DNAand proteins.

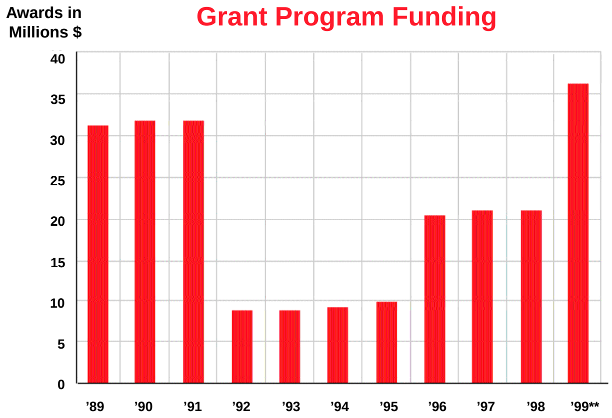
2) High-field NMR spectrometers, x-ray sources and detectors to probe the 3-D structure of proteins.

3) Confocal microscopes, NMR imaging devices, cell sorters, and biosensors to study functional imaging of living systems.

4) High-performance computers to gather, process, archive, and retrieve complex information sets.

The SIG Program awards between $100,000 and $400,000 for the purchase of such instruments. Costs for technical personnel, supplies, service contracts, or maintenance are not supported. Typically, to promote optimal sharing, SIG instruments are located in central core facilities that provide technical expertise and user education, and foster research collaborations.

Shared Instrumentation Grant Program Funding



* President's budget request

There is one receipt date annually for SIG applications, usually in March. Eligibility criteria, guidelines, and application procedures are described in a program announcement available through the NCRR Web site (address provided below).

Applications for SIGs are reviewed by instrument-specific study sections based on the following criteria: Demonstrated need for a new or updated instrument; enhancement of the NIH-funded research projects; appropriate technical expertise; adequacy of the plan to administer the grant and assure equitable use, institutional commitment, and benefit to the biomedical research community.

To obtain instruments that cost over $500,000, applicants may be eligible for joint funding by NIH and the National Science Foundation. Potential applicants are strongly encouraged to contact the SIG Program office at 301-435-0772, fax: 301-480-3775, e-mail: SIG@ncrr.nih.gov.

Current as of March 1998

For additional information contact:

Director, Biomedical Technology
NCRR-NIH
6705 Rockledge Drive, Suite 6050
Bethesda, MD 20892-7965
phone: 301-435-0755
fax: 301-480-3659
e-mail: BTA@ncrr.nih.gov
NCRR Home Page: http://www.ncrr.nih.gov

Other available NCRR publications:

Biomedical Technology Resources directory

NCRRHighlights magazine

NCRRReporter magazine

National Center for Research Resources brochure

Biomedical Technology Resources*

BIOENGINEERING

Biocalorimetry Center, Johns Hopkins University, Baltimore, MD

Biocurrents Research Center, Marine Biological Laboratory, Woods Hole, MA

Biomedical Simulations Resource, University of Southern California School of Engineering, Los Angeles

Computer Vision Center for Vertebrate Brain Mapping, Drexel University (Imaging and Computer Center), Philadelphia, PA

Michigan Center for Neural Communication Technology, University of Michigan, Ann Arbor

National ESCA and Surface Analysis Center for Biomedical Problems, University of Washington, Seattle

Resource on Medical Ultrasonic Transducer Technology, Pennsylvania State University, University Park

Simulation Resource in Mass Transport and Exchange, University of Washington, Seattle

FLOW CYTOMETRY

National Flow Cytometry and Sorting Research Resource, Los Alamos National Laboratory, NM

INTEGRATED TECHNOLOGIES

Comprehensive Biology–Exploiting the Yeast Genome, University of Washington, Seattle

Resource Center for Biomedical Complex Carbohydrates, University of Georgia, Athens

ISOTOPES AND PARTICLES

National Stable Isotope Resource at Los Alamos, Los Alamos National Laboratory, NM

National Tritium Labelling Facility, Lawrence Berkeley National Laboratory, Berkeley, CA

Radiological Research Accelerator Facility, Columbia University, New York, NY

*For information on each center's capabilities, request the *Biomedial Technology Resources* directory at 301-435-0888 or ospio@ncrr.nih.gov.

LASER APPLICATIONS

Center for Fluorescence Spectroscopy, University of Maryland School of Medicine, Baltimore, MD

Developmental Resource for Biophysical Imaging and Opto-Electronics, Cornell University, Ithaca, NY

Laboratory for Fluorescence Dynamics, University of Illinois at Urbana-Champaign

Laser Biomedical Research Center, Massachusetts Institute of Technology, Cambridge

Laser Microbeam and Medical Program, University of California, Irvine

University of Pennsylvania Ultrafast Optical Processes Laboratory, Philadelphia

MAGNETIC RESONANCE IMAGING (STRUCTURE AND FUNCTION)

Biomedical Magnetic Resonance Research & Technology Center , University of Illinois at Urbana-Champaign

Center for Advanced Magnetic Resonance Technology, Stanford University Medical Center, Stanford, CA

Clinical MR Studies at 4.1T: AResearch Resource, University of Alabama at Birmingham

Integrated Center for In Vivo Microscopy, Duke University Medical Center, Durham, NC

Multidisciplinary NMR Center for Biomedical Research, Carnegie Mellon University, Pittsburgh

NMR Imaging and Localized Spectroscopy at High Magnetic Fields, University of Minnesota, Minneapolis

Resource for Magnetic Resonance Research & Optical Research , University of Pennsylvania, Philadelphia

MAGNETIC RESONANCE SPECTROSCOPY

Biotechnology Resource in Pulsed EPR Spectroscopy, Albert Einstein College of Medicine, Bronx, NY

Center for Magnetic Resonance, Massachusetts Institute of Technology, Cambridge, MA

EPR Center for the Study of Viable Systems, Dartmouth Medical School, Hanover, NH

Illinois Electron Paramagnetic Resonance Research Center, University of Illinois, Urbana

National Biomedical Electron Paramagnetic Resonance Center, Medical College of Wisconsin, Milwaukee

National Magnetic Resonance Facility at Madison, University of Wisconsin-Madison

Resource for Solid-State NMR of Proteins, University of Pennsylvania, Philadelphia

Southwestern Biomedical Magnetic Resonance Facility, University of Texas Southwestern Medical Center, Dallas

MASS SPECTROMETRY

Bio-organic, Biomedical Mass Spectrometry Resource, University of California, San Francisco

Mass Spectrometry Resource for Biology and Medicine, Boston University School of Medicine

Michigan State University Mass Spectrometry Facility, Department of Biology, East Lansing

National Resource for Mass Spectrometric Analysis of Biological Macromolecules, Rockefeller University, NY

Resource for Biomedical and Bio-organic Mass Spectrometry, Washington University, St. Louis, MO

OPTICAL AND ELECTRON MICROSCOPY

Biological Microscopy & Image Reconstruction Resource, New York State Department of Health, Albany

Integrated Microscopy Resource, University of Wisconsin, Madison

National Center for Microscopy & Imaging Research at San Diego, University of California, LaJolla, CA

STEM Mass Mapping and Heavy Atom Labeling of Biomolecules, Brookhaven National Laboratory, Upton, Long Island, NY

Three-Dimensional Electron Microscopy of Macromolecules, Baylor College of Medicine, Houston, TX

Three-Dimensional Fine Structure of Cells and Tissues, University of Colorado, Boulder

SIMULATION AND COMPUTATION

Human Genetic Analysis Resource, Case Western Reserve University, Cleveland, OH

Interactive Graphics for Molecular Studies and Microscopy, University of North Carolina, Chapel Hill

Multiscale Modeling Tools for Structural Biology, The Scripps Research Institute, LaJolla, CA

National Biomedical Computation Resource, University of California, San Diego

Parallel Computing Resource for Structural Biology, University of North Carolina, Chapel Hill

Parallel Processing Resource for Biomedical Scientists, Cornell University, Ithaca, NY

Prophet: ANational Resource for Life Science Research, Cambridge, MA

Resource Facility for Population Kinetics, University of Washington, Seattle

Resource for Biomolecular Graphics, University of California, San Francisco

Resource for Macromolecular Modeling and Bioinformatics, University of Illinois at Urbana-Champaign

Resource for the Study of Neural Models of Behavior, University of Rochester, NY

Supercomputing Resources for the Biomedical Community, Carnegie Mellon University, Pittsburgh, PA

Theoretical Simulation of Biological Systems, Columbia University, New York, NY

SYNCHROTRON RADIATION

BioCARS, Synchrotron Structural Biology Resource, University of Chicago, IL

Biophysics Collaborative Access Team (BioCAT), Illinois Institute of Technology, Chicago

Macromolecular Diffraction Biotechnology Resource, Cornell University, Ithaca

Regional Center for Time-Resolved Synchrotron Spectroscopy, Albert Einstein College of Medicine, Bronx, NY

Synchrotron Radiation Biotechnology Resource, Stanford University, Stanford, CA